

Implicit differentiation worksheet for Calculus 1

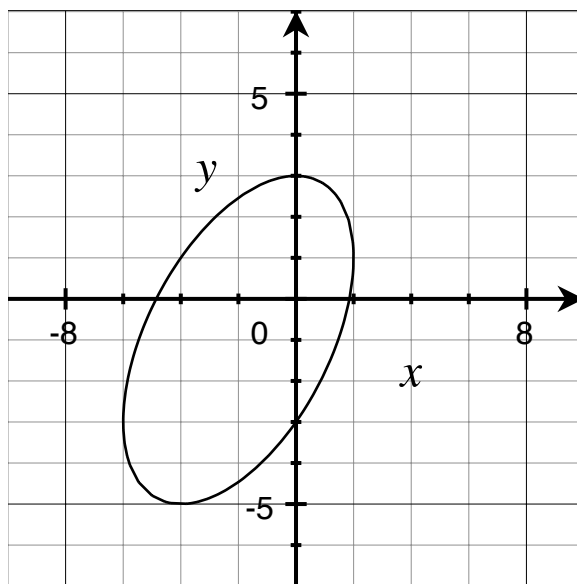
Determine dy/dx for each of the following.

- (1) $y = x^2 + xy$
- (2) $x^2y + y = 3$
- (3) $x^{1/4} + y^{1/4} = 2$
- (4) $x^{1/3} + y^{1/3} = 7$
- (5) $\sqrt{x} + \sqrt{y} = 25$
- (6) $x^2 + y^2 = 1.1$
- (7) $x^3 + y^3 = \sqrt{5}$
- (8) $x + \sin(y) = y + 1$

- (9) $y\sqrt{x} + x\sqrt{y} = 16$
- (10) $x^2 + xy - y^3 = xy^2$
- (11) $x^2 + y^2 = \sqrt{7}$
- (12) $x^{2/3} + y^{2/3} = a^{2/3}$ (a is a constant)
- (13) $x^ay^2 + x^by + x^c = 0$ (a, b, c constants)
- (14) $\sin(xy) = 2x + 5$
- (15) $x \ln(y) + y^3 = \ln(x)$
- (16) $e^{\cos(y)} = x^3 \sin(y)$

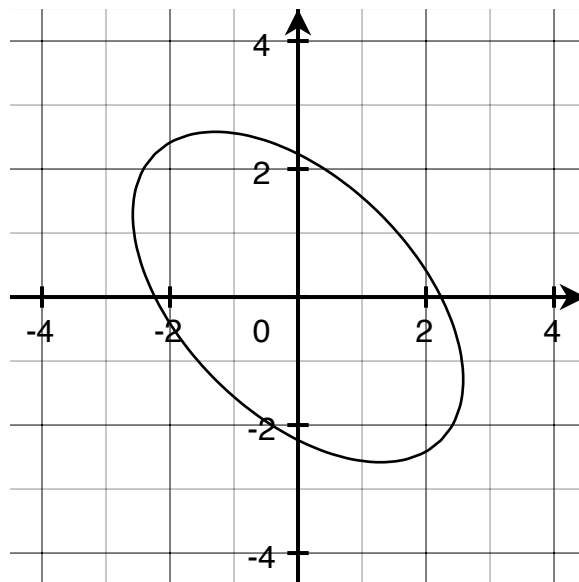
Determine d^2y/dx^2 for each of the following.

- (17) $1 - xy = x - y^2$
- (18) $x - y = (x + y)^2$
- (19) $x^{2/3} + y^{2/3} = 8$
- (20) $\sin(x) - 4 \cos(y) = y$



For the curve $x^2 + y^2 - xy + 3x - 9 = 0$ (above),

- (21) Determine dy/dx .
- (22) Where do the horizontal tangent lines occur?
- (23) Where do the vertical tangent lines occur ($dy/dx = \pm\infty$)?
- (24) Determine d^2y/dx^2 .



For the curve $x^2 + xy + y^2 = 5$ (above),

- (25) Determine dy/dx .
- (26) Where do the horizontal tangent lines occur?
- (27) Where do the vertical tangent lines occur ($dy/dx = \pm\infty$)?
- (28) Determine d^2y/dx^2 .

Consider the equation

$$(\cos x)y^2 + (3\sin x - 1)y + (7x - 2) = 0$$

- (29) Check that $x = 0$, $y = 2$ satisfies this equation.
- (30) Find dy/dx at the point $(0, 2)$ using implicit differentiation.
- (31) Use the quadratic formula to solve for y in terms of x . (Should you use “+” or “-”? Why?)
- (32) Would you like to find dy/dx using that formula for y ? (Me neither...)

Find $f'(x)$ in terms of $g(x)$ and $g'(x)$, where $g(x) > 0$ for all x . (Hint: if a is a constant then $g(a)$ is constant.)

(33) $f(x) = g(x)^3$

(34) $f(x) = g(x)(x - a)$

(35) $f(x) = g(a)(x - a)$

(36) $f(x) = g(x + g(x))$

(37) $f(x) = \frac{g(x)}{x - a}$

(38) $f(x) = \frac{1}{g(x)}$

(39) $f(x) = g(xg(a))$

(40) $f(x) = \sqrt{g(x)^2}$

(41) $f(x) = \sqrt{g(x^2)}$

(42) $f(2x + 3) = g(x^2)$